

**WHAT IS CLAIMED IS:**

1. A supersonic aircraft comprising:
  - a fuselage extending forward and aft along a longitudinal axis, the fuselage having a lower surface and an upper surface;
  - a highly swept low aspect ratio wing coupled to the fuselage, the wing having a forward leading edge and an aft trailing edge;
  - an effector flap coupled to the wing trailing edge;
  - a tail empennage coupled to the fuselage aft of the wing on the fuselage upper surface in a position high relative to the wing, the tail empennage forming a channel region subject to complex shock patterns;
  - an effector coupled to the tail empennage; and
  - a controller coupled to the effector flaps and the effectors, the controller further comprising a control process that reduces drag through channel relief by deflecting both the effector flap down and the effector up.
2. The aircraft according to Claim 1 wherein:
  - the tail empennage has an inverted V-tail geometry coupled to the wing in a braced wing configuration further comprising a vertical stabilizer, lateral inverted stabilizers, and inverted V-tail control surface ruddervators; and
  - the controller further comprises a control process capable of adjusting the aircraft longitudinal lift distribution for a selected supersonic Mach number to maintain a low sonic-boom, low drag-trim condition.
3. The aircraft according to Claim 1 wherein:
  - the tail empennage has a supersonic T-tail geometry further comprising a vertical stabilizer, a lateral horizontal stabilizer, and a control surface elevator; and
  - the controller further comprises a control process capable of adjusting the aircraft longitudinal lift distribution for a selected supersonic Mach number to maintain a low sonic-boom, low drag-trim condition.

4. The aircraft according to Claim 1 wherein:  
the controller further comprises a control process that increases drag by choking the channel, deflecting both the effector flap up and the effector down.
5. The aircraft according to Claim 1 wherein:  
the controller further comprises a control process that increases drag for operation as a speedbrake for usage in emergency descents by choking the channel, deflecting both the effector flap up and the effector down.
6. The aircraft according to Claim 1 further comprising:  
engines coupled to the aft portion of the wing lower surface; and  
an inverted V-tail geometry empennage coupled to the wing in a braced wing configuration and carrying lift at the aft portion of the aircraft on a high mounted tail, the length of the aircraft being effectively lengthened for shock waves below the aircraft, thereby further reducing sonic boom, the inverted V-tail carrying tail lift high to maintain a continuous lift distribution and structurally bracing the wing and engines.
7. A supersonic aircraft comprising:  
an aircraft body extending forward and aft;  
a highly swept low aspect ratio wing coupled to the body, the wing having a forward leading edge and an aft trailing edge;  
an effector flap coupled to the trailing edge of the wing;  
an inverted V-tail coupled at the aft portion of the aircraft body and coupled to the wing in a braced wing configuration, the inverted V-tail forming a channel region that can generate complex shock patterns;  
ruddervator control surfaces coupled to the inverted V-tail; and  
a controller coupled to the effector flap and the ruddervator control surfaces, the controller comprising a control process that reduces drag through channel relief by deflecting both the effector flap down and the ruddervator control surfaces up.

8. The aircraft according to Claim 7 wherein:  
the controller further comprises a control process that increases drag by choking  
the channel, deflecting both the effector flap up and the effector down.
9. The aircraft according to Claim 7 wherein:  
the controller further comprises a control process that increases drag for operation  
as a speedbrake for usage in emergency descents by choking the channel,  
deflecting both the effector flap up and the effector down.
10. The aircraft according to Claim 7 further comprising:  
two wing-mounted engines positioned beneath the wing at an aft location, the  
braced wing V-tail supporting the engines and enabling trim for a low  
sonic boom lift distribution.
11. The aircraft according to Claim 10 wherein:  
the engines have a highly integrated wing/inlet geometry that enables low-boom  
compatibility and low inlet/nacelle installation drag.
12. The aircraft according to Claim 7 wherein:  
the controller further comprises a control process that adjusts aircraft longitudinal  
lift distribution for a selected Mach number to maintain a low sonic boom,  
low drag-trim condition..
13. The aircraft according to Claim 7 wherein:  
the body has a slender body configuration that maintains volume-based sonic  
boom ruling.
14. A supersonic aircraft comprising:  
the fuselage extending forward and aft along a longitudinal axis and having a  
lower surface and an upper surface;  
a wing coupled to the fuselage;  
an empennage coupled to the fuselage and forming an airflow channel over the  
wing and through the empennage;

means mounted on the wing and on the empennage for effecting airflow in the channel;  
means for actuating the airflow effecting means; and  
means for controlling the actuating means to reduce drag through channel relief by deflecting the airflow effecting means in a first mode and by increasing drag by speedbraking in a second mode.

15. A channel control system for usage in a supersonic aircraft including a fuselage, wings, a tail empennage, and a plurality of control effectors coupled to the wings and the tail empennage, the empennage and wings forming a channel region that can form complex shock patterns at transonic speeds, the channel control system comprising:

a plurality of actuators coupled to the control effectors, the effectors including a flap coupled to the wing and an effector coupled to the tail empennage;  
and  
at least one vehicle management computer coupled to the plurality of actuators, the at least one vehicle management computer further comprising a process for managing the control effectors in a drag reduction mode through channel relief by deflecting both the flap downward and the tail empennage effector upward.

16. The system according to Claim 15 further comprising:  
a process executable in the at least one vehicle management computer for managing the control effectors in a speedbrake mode that increases drag by choking the channel and deflecting the flap upward and the tail empennage effector downward.

17. The system according to Claim 15 wherein:  
the wing is a highly swept low aspect ratio wing coupled to the body, the wing having a forward leading edge and an aft trailing edge, and an effector flap coupled to the trailing edge of the wing;  
the tail empennage is in a configuration of an inverted V-tail coupled at the aft portion of the aircraft body and coupled to the wing in a braced wing

configuration, the tail empennage comprising ruddervator control surfaces coupled to the inverted V-tail; and  
the at least one vehicle management computer further comprises a channel relief process that reduces drag through channel relief by deflecting both the effector flap downward and the ruddervator upward.

18. The system according to Claim 15 wherein:  
the wing is a highly swept low aspect ratio wing coupled to the body, the wing having a forward leading edge and an aft trailing edge, and an effector flap coupled to the trailing edge of the wing;  
the tail empennage is in a configuration of an inverted V-tail coupled at the aft portion of the aircraft body and coupled to the wing in a braced wing configuration, the tail empennage comprising ruddervator control surfaces coupled to the inverted V-tail; and  
the at least one vehicle management computer further comprises a speedbrake process that increases drag by deflecting both the effector flap upward and the ruddervator downward.

19. The system according to Claim 15 wherein:  
the wing is a highly swept low aspect ratio wing coupled to the body, the wing having a forward leading edge and an aft trailing edge, and an effector flap coupled to the trailing edge of the wing;  
the tail empennage is in a configuration of a T-tail coupled at the aft portion of the aircraft body.

20. The system according to Claim 15 wherein:  
the aircraft further includes a differential canard coupled to the body, the canard including an actuator coupled to the at least one vehicle management computer; and  
the at least one vehicle management computer deflects the canard in combination with the control effectors to facilitate drag reduction and drag augmentation for usage as a speed brake.

21. The system according to Claim 15 wherein:  
the effector flaps are wing trailing edge surfaces; and  
the effectors are selected from a group consisting of ruddervators, leading edge  
devices for a horizontal tail, and/or a horizontal stabilizer.